**1.6.4 Embodied Energy of Wood-Based Roof Assemblies in the U.S.**

| | R-Value | Embodied Energy (MMBtu/SF) (1) | CO2 Equivalent Emissions (lbs/SF) |
|---|---|---|---|
| Glulam Joist with Plank Decking (3) | | | |
| with EPMD membrane | 40.56 | 0.2 | 18.13 |
| with PVC membrane | 40.56 | 0.17 | 14.93 |
| with Modified bitumen membrane | 40.56 | 0.14 | 12.88 |
| with 4-Ply built-up roofing | 40.89 | 0.81 | 63.75 |
| with Steel roofing | 41.17 | 0.16 | 15.02 |
| Wood I-Joist with WSP Decking (4) | | | |
| with PVC membrane | 26.38 | 0.11 | 8.70 |
| with 4-Ply built-up roofing | 26.71 | 0.75 | 57.52 |
| Solid Wood Joist with WSP Decking (4) | | | |
| with Modified bitumen membrane | 26.38 | 0.10 | 6.77 |
| Wood Chord / Steel Web Truss with WSP Decking (4) | | | |
| with Modified bitumen membrane | 26.80 | 0.10 | 9.71 |
| Wood Truss (Flat) with WSP Decking (4) | | | |
| with Modified bitumen membrane | 25.60 | 0.09 | 7.10 |
| Wood Truss (4:12 Pitch) with WSP Decking (4) | | | |
| with 30-yr Fibreglass Shingles | 25.60 | 0.08 | 6.97 |
| with Clay Tile | 25.60 | 0.22 | 22.07 |

Note(s): Assumptions: 60 year building lifetime. Low rise building. Values are general estimations for the U.S. 1) Embodied Energy: Energy use includes extraction, processing, transportation, construction, and disposal of each material. 2) Resource Use: The weight of raw materials used in extraction, processing, transportation, construction and disposal of each material. 3) Includes membrane, 8" rigid insulation, vapor barrier, and latex paint. 4) Includes membrane, 9.5" batt insulation, vapor barrier, gypsum board, and latex paint. WSP = wood structural panel.

Source(s): Athena Institute. Athena EcoCalculator for Assemblies v.2.3. 2007. Available at www.athenasmi.org/tools/ecoCalculator/index.html